

Appl. No. 10/533,691
Reply to Office Action of March 25, 2008
Amendment dated: May 16, 2008

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AMENDMENT TO THE CLAIMS:

This listing of claims will replace all prior versions, and listings, of claims in the application:

1. (Currently Amended) A liquid discharge apparatus comprising discharge control means including:
a liquid chamber for storing liquid;
~~two first and second~~ pressure generating elements or more provided at the liquid chamber, and serving to eject liquid stored within the liquid chamber; and discharge holes for discharging the liquid, and
~~wherein a discharge control means is adapted so that, with for controlling~~
~~energy delivered to each one of the respective pressure generating elements being as~~
~~reference in each of a first mode and a second mode, the first mode delivering energy~~
~~to each one of the respective pressure generating elements at a substantially same~~
~~timing in order to eject ink at a substantially perpendicular direction from an output~~
~~surface of the discharge hole, and the second mode delivering substantially a same~~
~~energy to each one of the respective pressure generating elements at different timings~~
~~such that a second energy pulse delivered to the second pressure generating element is~~
~~shifted a minimum of 7.5% and a maximum of 20% from a reference first energy~~
~~pulse delivered to the first pressure generating element such that ink is discharged~~
~~from the discharge hole at an angle offset from the perpendicular the discharge~~
~~control means delivers energy to the other pressure generating element in the state~~
~~where timing is shifted in a time of the range within 20% of supply time of energy~~
~~serving as reference with respect to supply timing of energy serving as reference.~~

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2. (Cancelled)

3. (Original) The liquid discharge apparatus as set forth in claim 1, wherein the discharge means is adapted so that the discharge holes are provided in parallel in substantially line form.

4. (Currently Amended) A liquid discharge method for a liquid discharge apparatus including:

providing a liquid chamber for storing liquid;

~~two providing first and second~~ pressure generating elements ~~or more~~ provided at the liquid chamber, and serving to eject liquid stored within the liquid chamber; and

providing discharge holes for discharging the liquid from the liquid chamber,

providing a discharge control means for delivering energy to each one of the respective pressure generating elements in each of a first mode and a second mode,

and

wherein delivering energy delivered to one of to each of the respective pressure generating elements in a first mode wherein substantially a same energy is delivered at substantially a same timing in order to eject ink at a substantially

perpendicular direction from an output surface of the discharge hole, and delivering energy to each of the respective pressure generating elements in a second mode wherein substantially a same energy is delivered to each one of the respective

pressure generating elements at different timings such that a second energy pulse delivered to the second pressure generating element is shifted a minimum of 7.5% and a maximum of 20% from a reference first energy pulse delivered to the first pressure generating element such that ink is discharged from the discharge hole at an angle

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~~offset from the perpendicular is caused to be reference, and energy is delivered to the other pressure generating element in a time of the range within 20% of supply time of energy serving as reference with respect to supply timing of energy serving as reference to control discharge angle when the droplet is discharged from the discharge hole.~~

5. (Canceled)

6. (Original) The liquid discharge method as set forth in claim 4, wherein the discharge holes are provided in parallel in substantially line form.

Please add the following new claims:

7. (New) The liquid discharge apparatus as set forth in claim 1, wherein a third pressure generating element is provided at the liquid chamber, and said discharge control means delivers a third energy pulse in said second mode to said third pressure generating element shifted a minimum of 7.5% and a maximum of 20% from the reference first energy pulse delivered to the first pressure generating element.

8. (New) The liquid discharge apparatus as set forth in claim 7, wherein a fourth pressure generating element is provided at the liquid chamber, and said discharge control means delivers a fourth energy pulse in said second mode to said fourth pressure generating element shifted a minimum of 7.5% and a maximum of 20% from the reference first energy pulse delivered to the first pressure generating element.

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9. (New) The liquid discharge method as set forth in claim 4, wherein a third pressure generating element is provided at the liquid chamber, and said discharge control means delivers a third energy pulse in said second mode to said third pressure generating element shifted a minimum of 7.5% and a maximum of 20% from the reference first energy pulse delivered to the first pressure generating element.

10. (New) The liquid discharge method as set forth in claim 9, wherein a fourth pressure generating element is provided at the liquid chamber, and said discharge control means delivers a fourth energy pulse in said second mode to said fourth pressure generating element shifted a minimum of 7.5% and a maximum of 20% from the reference first energy pulse delivered to the first pressure generating element.

11. (New) The liquid discharge apparatus as set forth in claim 1, wherein said discharge control means comprises a switch control circuit and a first and second switch respectively connected to said first and second pressure generating elements, wherein in said second mode, said switch control circuit delays the closing of said second switch from an open to a closed position at a minimum of 7.5% and a maximum of 20% relative to the closing of said first switch from an open to a closed position.

12. (New) The liquid discharge method as set forth in claim 4, wherein said discharge control means comprises a switch control circuit and a first and second switch respectively connected to said first and second pressure generating elements, wherein in said second mode, said switch control circuit delays the closing of said

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second switch from an open to a closed position at a minimum of 7.5% and a maximum of 20% relative to the closing of said first switch from an open to a closed position.

13. (New) The liquid discharge apparatus as set forth in claim 1, wherein said discharge control means functions to prevent ink droplets discharged from said discharge holes from contacting an edge portion of the discharge hole and thereby resulting an unevenness of ink discharge angles.

14. (New) The liquid discharge method as set forth in claim 4, wherein said discharge control means functions to prevent ink droplets discharged from said discharge holes from contacting an edge portion of the discharge hole and thereby resulting an unevenness of ink discharge angles.